Available online at www.sciencedirect.com
ScienceDirect
Procedia - Social and Behavioral Sciences 174 (2015) 115 – 121
Procedia
Social and Behavioral Sciences

INTE 2014

Work, games and lifelong learning in the 21st century

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Abstract

The digital revolution of the last two decades has introduced major changes in the different spheres of human activities, from professional, academic to social spheres. Information and Communication Technologies (ICT) has facilitated communication and permitted new forms of work and learning, overcoming the traditional constraints of time and space. Nowadays, the frontiers of work, learning and social activities of the knowledge workers have blurred in the same digital environment, making the shifting possibilities between activities easier than ever. Digital leisure activities, such social networking and gaming have also entered the digital environment, increasing the opportunities of distraction from work, learning and social activities. Knowledge workers of the 21st century should develop a new Work Lifelong Learning Balance (WLLB) in order to ensure to maintain their professional, family, social, personal and lifelong learning balance.

Peer-review under responsibility of the Sakarya University

Keywords:

1. Work Lifelong Learning Balance

The rapid knowledge emergence and obsolescence in the 21st century is generating new societal challenges. Individuals and organizations are required to embrace Lifelong Learning (LLL) strategies in order to remain competitive in the globalized world. The 21st century citizen should not only try to achieve a Work Life Balance (WLB) but a Work Lifelong Learning Balance (WLLB) in order to keep updated and adapt to the evolution of the professional careers. At the same time, Information and Communication Technologies (ICT) has contributed to the acceleration of the knowledge (co)creation and worldwide just-in-time access, but has also become one of the main supporters of Lifelong Learning through informal and formal learning resources, activities and courses offered in

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Peer-review under responsibility of the Sakarya University
doi:10.1016/j.sbspro.2015.01.634

blended and online learning modalities. In this context, digital literacy has become one of the key competencies of the 21st century.

1.1. Positive Lifelong Learning Experiences

The 21st century citizen is required to develop 21st century skills in order to adapt to the knowledge evolution and technological innovations in the workplace. The 21st century context requires a new set of competences beyond the obvious ICT literacy: communication, collaboration, social and cultural skills, creativity, critical thinking, problem-solving, productivity in a globalized world, learning to learn skills, self-direction, planning, flexibility, risk taking, conflict management and a sense of initiative and entrepreneurship (Voogt & Pareja Roblin, 2012). These 21st century skills require a learner centered approach to provide positive and meaningful lifelong learning experiences through active learning approaches. Prince defines active learning as "any instructional method that engages students in the learning process" (p. 223). Learners' engagement in a learning activity results from the combination of the learners' willingness to participate in the learning activities and the efforts the learner engages during the efficient time-on-task (Romero, 2012). Coates (2005, p. 26) defines learners' engagement as "the extent to which students are actively involved in a variety of educational activities that are likely to lead to high quality learning". Coates highlight the active role of the learner in the activity that is required for achieving the learners' engagement. The learners' engagement has been considered as a continuum with different degrees of engagement, from disengagement to the experience of flow, considered by Csikszentmihalyi (1991) as the complete engagement or absorption in an activity. In the state of flow "the sense of duration of time is altered; hours pass by in minutes, and minutes can stretch out to seem like hours" (p. 49). Csikszentmihalyi identifies the playing activity as one of the activities that helps players' "achieve an ordered state of mind that is highly enjoyable" (p. 72). Game-Based Learning (GBL) is experiencing an increasing acceptance in the lifelong learning context as an active learning methodology, which could engage learners' in the 21st century skills (Prensky, 2002; Steinkuehler, Squire, & Barab, 2012) and provides a positive learning experience. We explore in the next section different types of GBL which could contribute to achieve the lifelong learning challenges through engaging and positive gaming experiences.

2. Game-Based Learning: from Serious Games to Gamification

Game is a form of "organized play" (Prensky, 2001, p. 119), "an activity, in which participants follow prescribed rules that differ from those of real life [while] striving to attain a challenging goal" (Heinich, Molenda, Russell, & Smaldino, 2002, p. 10). The use of games for educational purposes shows a great diversity. The GBL spectrum ranges from ad-hoc designed digital serious games which allies learning objectives in a game universe with a certain cognitive and visual immersion and gameplay to gamification as "the use of game design elements in non-game contexts" (Deterding, Dixon, Khaled, & Nacke, 2011, p.1).

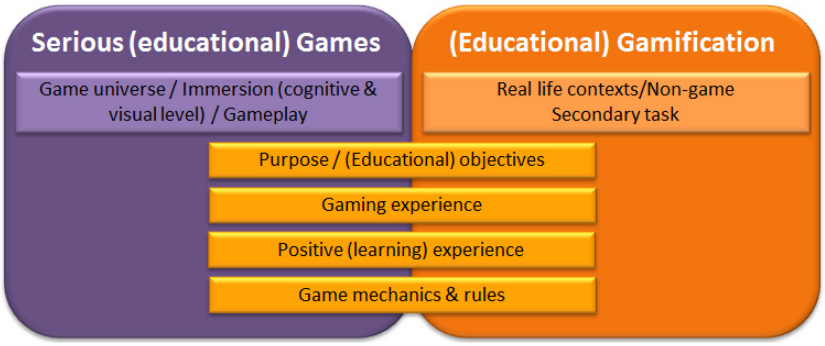


Fig. 1. Serious (educational) games and (educational) gamification.

Figure 1 shows the core elements of serious games and the differences between serious games and gamification in educational contexts. Both serious games and gamification aim to support the learning objectives of the player/learner through a positive learning and gaming experience. In both cases, the game mechanics and rules serves to create positive learning and gaming experience, for example, introducing competitive rules and a scoring system or challenging the player in the learning progress through different missions and battles. The main difference between serious games and gamification lies on the existence of a digital game universe with a certain cognitive and visual engagement in serious games. Otherwise, gamification is a kind of "game-based layer" to real life contexts, where the game elements are a secondary layer of the reality. Choosing between a serious games or a gamification strategy is a decision-making which should take into account not only the learning objectives but also the learners' context analysis in order to define which are the learning needs, the organization needs and resources and the constraints to be considered in the GBL activity design.

3. HEXA-GBL, a methodology for GBL design and evaluation

The HEXA-GBL is a six-phase methodology for designing and evaluating GBL activities from a learner centered perspective. The HEXA-GBL design and evaluation is organized on six steps. The first four phases focus on the game design activity, from the learning objectives definition, the learner-centered need analysis, and the definition of the game modalities, mechanics and rules. The final two phases focus on the play activity evaluation from the perspective of the learning outcomes, assessment and feedback, but also from the learners' gaming and learning experience during the GBL activity.

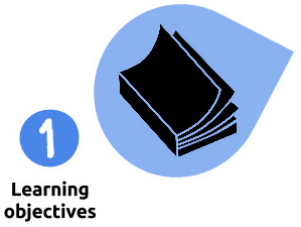
Fig. 2. HEXA-GBL, a methodology for GBL design and evaluation.

Through our step-by-step methodology we aim to facilitate the decision-making concerning the type of GBL activity and its modalities that could better fit to the learning objectives, the learners' needs and the (in)formal education context and resources. When engaging in the design of a GBL activity we aim to achieve the goals of learning and gaming experience adapting the GBL type, modalities, artifacts and complexity to the learners' needs and context. We aim to overcome the barriers of GBL in terms of costs (reusing and repurposing existing artifacts, or creating new ones), focusing on the game mechanics and the different possibilities of operationalization with high and low tech solutions and adapting the design process to normal-human teachers and professors, which have not always all the superpowers involving game design.

The table below introduces the methodological procedure and reflective questions in each of the six steps of the HEXA-GBL methodology.

Table 1. HEXA-GBL methodology.

HEXA-GBL phase	Objectives

1. Learning objectives 	• Learning objectives are the key point in starting to design the GBL activity.
	• Identification of the formal or informal learning context
	  ○ In context of formal education, curriculum integration should be considered.
	  ○ In context of informal education, the learner/parents/educators should define the learning objectives in relation to the personal development
	• Identification of the primary and secondary learning objectives in terms of knowledge or 21st century skills.
	• Define which of the learning objectives will be part of the learning assessment and which type of feedback or group awareness will be offered as a display of progression to the learners during the game or gamification activity.

2. Learner-centered need analysis 	• Decision making in relation to the learners' prior knowledge and competences (PKC)
	• Analysis of prior knowledge and competences (PKC) of the learners. Decide if the PKC (1) will be analyzed before starting the game (or is already available), (2) will be declared by the learners' themselves or (3) will be integrated as a part of the game.
	• Analyze (expected) diversity among learners' based (if possible) in PKC.
	• Evaluate the distance between learners' prior knowledge and competences and the learning objectives ones.
	• Organize the learning objectives in levels considering two main theories (ZDP, Flow).
	• Organize the learning paths according to the learners' diversity and the game modalities
	  ○ If individual game, possibility to make players start at a certain level according to the prior knowledge/competences
	  ○ Il game engaging teams, possibility to create cooperative game dynamics to deal with intragroup diversity
	• Decision making in relation to the learners preferences and characteristics (individualistic), the context and resources available, and the language needs, especially if you are not in an English speaking community.

3. Game modalities  	• Decision making for choosing the type of GBL modality o Firstly, start identifying the existing SG according to the learning objectives. If a SG already exists and matches your learners' needs, and organization resources and constraints you can choose it. o Secondly, if the SG you have identified in the previous step only matches partially the learning objectives or the learners' needs you can analyze the possibility to adapt the game (if possible). o Thirdly, if the existing SG could not be adapted you can consider the possibility to design and create your own game. If you have enough resources you can collaborate with professional developers; if not, you can use one of the game design platforms freely available (e.g. Scratch, Ren'Py…). o Fourthly, an alternative to game creation could be to repurpose an existing game, such as using Angry Birds for learning mathematics. o Finally, you can opt for educational gamification and add the game components you have identified to better fit your learning objectives and learner centered analysis of the context (e.g. public scoring and competitive team, reward system…).
4. Game mechanics and rules  	• Decision making in relation to the game mechanics and rules intended to engage the learner in the gaming and learning experience. o Firstly, take into account the individual or collaborative nature of the learning objectives (first phase of the HEXA-GBL methodology) and the learner centered need analysis (second phase). For example, if learners lack participation in knowledge construction in the context of a biology course, the game mechanics could encourage intragroup cooperation and intergroup competition in a text-based environment. o Secondly, the game rules should be aligned with the learning objectives (first phase) and the learning assessment and feedback (fifth phase) in order to incentivize the learning progression in the game.
5. Learning assessment and feedback  	• The last two phases of the HEXA-GBL methodology aim to analyze the effective impact of the game on the learning objective achievement but also on the gaming experience (sixth phase). Assessment is an essential part of the GBL activity. Without an appropriate assessment of the learning progression and outcomes the end-user could have the perception of being engaged in a playful activity that was not related to the learning objectives (first phase). • The learning assessment and feedback should derivate from the learning objectives (first phase). According to the needs identified in the second phase (learner-centered need analysis), there are three main types of assessment that could be introduced in the game: diagnostic, formative and summative assessment. • For each of the learning assessment integrated in the game, there is the possibility to provide feedback to the individual learner/player, and even go further, and share the diagnostic/formative/summative assessments among the team or the group of players through knowledge group awareness widgets (Pifarré, Cobos, & Argelagós, 2014; Romero et al. 2012).

	• The GBL learning assessment should be considered according to the different time of the game. Usually, the diagnostic assessment is done before or at the early moments of the game, through a first mission which helps to situate the prior knowledge and skills of the learner. The diagnostic assessment could be useful in collaborative gaming mechanics to allow certain forms of group creation which can promote intragroup and intergroup cooperation and competition dynamics. During the game, the continuous assessment of the learning progression and its individual or collective reflection could contribute to the self-regulation process (Panadero & Romero, 2014) and the development of the knowledge group awareness. Finally, the game could provide the learner with a final assessment feedback, which could be related to the game score. The learning outcomes of GBL activity could contribute to knowledge and skills recognition in terms of the formal education curricular objectives. In informal settings, there is a growing use of badges as learning outcome recognition. Antin and Churchill (2011) define badges as "virtual goods", "digital artifacts that have some visual representation which are awarded to users who complete specific activities" (p. 10-11). • Last but not least, there is a need to define the assessment agent. While some serious games embed (artificial intelligence) modules to deploy the learning assessment, and event, to adapt to the learner progression, the assessment could be also done by the teacher, through peer assessment and self-assessment. The combination of different assessment agents could improve the quality and accuracy of the assessment related to the GBL activity.
6. Gaming and learning experience  	• All previous phases are not enough to ensuring a GBL experience from a player centered point of view. The pedagogical and playful (best) intentions could sometimes not achieve the desired objectives in terms of the positive gaming experience. We should accept that (a playful) gaming experience is recognized by a learner having been engaged as a player in the activity. This last phase aims to evaluate the player gaming and (positive) learning experience. • According to Kiili (2005, p. 14) "Games are designed to generate a positive affect in players and are most successful and engaging when they facilitate the flow experience". Kiili focus on the importance of immediate feedback, clear goals and challenges that are matched with the current learners' knowledge and skills to place them in the flow activity state. Sweetser and Wyeth (2005) propose to analyze the enjoyment of games through the analysis of eight elements (concentration, challenge, skills, control, clear goals, feedback, immersion, and social interaction).

4. Discussion

The HEXA-GBL methodology aims to facilitate GBL design and evaluation through a step-by-step methodology focused on the core questions of design and evaluation of GBL from a learner-player-centered approach. Through our step-by-step methodology we aim to facilitate the decision-making concerning the type of GBL activity (serious game, repurposed game, gamification) that could better fit to the learning objectives, the learners' needs and the (in)formal education context and resources. When engaging in the design of a GBL activity we aim to achieve the goals of learning and gaming experience adapting the GBL type, modalities, artifacts and complexity to the learners' needs and context. The HEXA-GBL methodology is not only conceived for resourceful educators and the game industry, but aims to facilitate the GBL design and evaluation in contexts where there is a lack of human (time,

skills, knowledge), monetary or technological resources to consider making an ad hoc game design. We aim to overcome the barriers of GBL in terms of costs (reusing and repurposing existing artifacts, or creating new ones), focusing on the game mechanics and the different possibilities of operationalization with high and low tech solutions. The HEXA-GBL process is for normal-human teachers and professors, which do not always have all the superpowers and resources required for a creating from scratch a professional pricey game. GBL relies on the ability of the teacher to propose an engaging positive learning experience to the learners founded on some of the game mechanics and rules in a way that supports achieving a leaner-centered gaming experience.

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